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## THE CHEMOPROPHYLAXIS OF TRYPANOSOMIASIS

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In a recent issue of the *Lancet* (1940) there appears an annotation on " The Chemoprophylaxis of Sleeping Sickness," a subject to which, as Beit Research Worker in Trypanosomiasis in Southern Rhodesia during the past four years, I have devoted considerable attention.

The annotation commences by stating that " since biological immunisation of man against sleeping-sickness seems impracticable it is not surprising that the prophylactic power of various drugs has been examined." I do not agree that the biological immunisation of man against sleeping sickness seems impracticable, since in the form of an immunity-tolerance it occurs in natural conditions in man and wild animals in tsetse-infested areas. Unfortunately it results in the creation of " carriers," the most important factor in the transmission and dissemination of trypanosomiasis. But in the light of present knowledge it is impossible to set up artificially by strictly biological methods a sterile immunity, although when more is known of Nature's methods it may be possible to do so.

Since 1927, I have set up in cattle an immunity-tolerance by chemotherapeutic methods, deliberately infecting them with the trypanosome of the district in which they are to be exposed to infection—generally a variety of *T. congolense*—and treating them at the appropriate time with tartar emetic or Antimosan. As this method also resulted in the creation of "carriers" and as the tolerance was apt to break down when the animals were exposed to adverse conditions, it was not entirely satisfactory. It was realised that a sterile immunity would be preferable, and it was the primary object of my work as Beit Research Worker to elaborate such a method. Encouraged by the well-known prophylactic properties of Bayer 205, I carried out numerous experiments upon animals, in the laboratory and in the field, with a view to conferring protection against trypanosomes of the *T. brucei* types, including the trypanosomes of sleeping-sickness, *T. gambiense* and *T. rhodesiense*, by chemotherapeutic means.

My numerous reports presented from time to time to the Beit Trustees have not been published in scientific literature, but, briefly stated, I came to the conclusion that a very definite and lasting immunity could be set up in experimental animals by the proper application of Bayer 205 or its British equivalent Antrypol, against the trypanosomes of the polymorphic varieties against which they exert a specific effect.

As stated in the annotation, a special and all-important feature of these preparations is their power to protect against infection for long periods, which is generally attributed to their prolonged retention in the body. Such a retention does undoubtedly occur, but, in the writer's opinion, if the injection is made into an animal not already infected, the prophylactic effects of the drug are not as lasting as they are generally supposed to be. Moreover, as the drugs are gradually eliminated there comes a time when sub-curative quantities only remain in the body, and the animal becomes susceptible to infection. If during this period of partial protection the animal is subjected to infection, a latent or subacute form of trypanosomiasis may become established, which only becomes acute when the last traces of the drugs are eliminated or the parasite becomes resistant to them. When such a latent infection occurs, trypanosomes may be difficult to find in the peripheral blood, but a serious anaemia and cachexia results, the cause of which is difficult to determine, and the parasite becoming resistant to the drug does not respond to it. For these reasons the treatment of non-infected subjects about to be subjected to repeated natural infections is not free from danger. In practice it is discouraged by some on the grounds that it may " mask infection." As will be seen later, however, the treatment of subjects already infected may yield entirely different results.

A pamphlet published by the British Drug Houses, Ltd., relating to Antrypol states, " It is suggested that the value of Antrypol in medicine is due to its power to raise the resistance of the patient rather than to any power to destroy the organisms of disease." In the writer's experience these protective properties are largely due, not to the drug *per se* but to an immunity resulting from the interaction of the drug, trypanosomes and tissues of the host. He has found that the degree and duration of this immunity is related to the number and virulence of the trypanosomes in the peripheral circulation and the quantity of the drug administered. If trypanosomes are few and only a sub-curative dose of the drug is injected, a temporary amelioration of symptoms may result but the trypanosomes eventually return and a relapse occurs. After a second dose the trypanosomes again disappear but reappear after a shorter interval. With each dose the interval becomes less and in course of time the parasite becomes resistant to the drug and the animal succumbs. In these cases the symptoms are as a rule similar to those described as occurring when the drug is administered before infection. On the other hand, if the infection is established and trypanosomes are numerous in the peripheral blood, a massive dose—the maximum consistent with safety—may sterilise the animal of the parasites, leaving it resistant to reinfection. A state of sterile immunity is set up which is reinforced by reinfection. My records—unfortunately still in Rhodesia, to which I had hoped to return—contain

details of a considerable number of cases immunised in this way which have remained in good health and resisted reinfection for periods longer than a year; whereas control animals receiving the same quantity of the drug but non-infected did not remain protected longer than one or two months.

The view that resistance may be reinforced by reinfection is borne out by the observation of Duke (1934) who records a "volunteer" who resisted infection by tsetse for 327 days after he had received 1 gramme Bayer 205, and writes "... a consideration of the behaviour of the volunteer Z. F. suggests that the repeated inoculation of living trypanosomes during the three months immediately following the administration of Bayer 205 led to the establishment of a more prolonged immunity than that conferred by the drug alone without such repeated exposures to infection. If this be true, than the more intensive the exposure in nature to infected tsetse the greater the benefit derived from the prophylactic." It is also in accordance with my own experience in the case of cattle protected against *T. pecorum*, *i.e.*, the Rhodesian variety of *T. congolense*, by treatment with antimony.

The prophylactic effects of other organic preparations against different species of trypanosomes have been observed by other workers. Thus Browning and Gulbransen (1934 and 1936) have studied a series of quinoline derivatives and have found that some of them exert prolonged protective effects. In the first place they appear to have attributed this to the retention of the drug in the tissues. In the case of Styryl 245 they write "even after a small dose has been injected the dye may be recognised over a year later." Later, however, they evolved Styryl 314, a *rapidly excreted drug* which they described in an article entitled "Immunity following Cure of Experimental *T. brucei* Infection by a Chemotherapeutic Agent." They state that "rabbits cured of infection with strains of *T. brucei* which do not confer complete protection in mice, possess a high degree of resistance to reinoculation with the homologous strain." Thus after cure by a single dose of the rapidly excreted drug Styryl 314, injected when symptoms of trypanosomiasis were marked, animals have remained refractory to repeated reinoculations up to two and three years later. There are now a considerable number of organic preparations which are said to possess trypanocidal properties, but, unfortunately, they are very specific in their affinities for different species of trypanosomes. Thus Bayer 205 is specific for the polymorphic varieties such as *T. gambiense* and the so-called *T. rhodesiense*, but not for the *congolense* types. On the other hand, Surfen C is effective for *T. congolense* but not for *T. brucei* or the *T. pecorum* of S. Rhodesia. If one could determine the principles upon which these affinities between drug and trypanosome depend, it might be possible to elaborate an agent effective against all species of trypanosomes. In view of the remarkable progress recently made in the preparation of organic chemotherapeutic agents, the writer confidently believes that this will in the near future be achieved.

It may be remembered that Rieckenberg (1917) found that if the blood of rats infected with *T. brucei* after treatment with certain drugs such as Bayer 205, was added to trypanosomes *in vitro*, the blood platelets tended to adhere to the trypanosomes. The reaction was referred to as "Reickenberg's phenomenon" or the "adhesion reaction." This reaction appears to be associated with immunity and is specific for the species and even the strain of trypanosome of which the treated animal has been cured. Brown, Broom and Horne (1936) have shown that the adhesion of platelets, red blood cells or other indicators *vis-à-vis* trypanosomes in the presence of the plasma of immune animals, is due to electrophoresis. The writer has found that when rats infected with *T. rhodesiense* are treated with subcurative doses of Bayer 205 and their blood plasma is added *in vitro* to blood containing the homologous trypanosomes, adhesion does not take place: but if the blood of an animal similarly infected but cured by treatment to the extent of being sterilised of the parasites is used, its blood plasma when mixed with a suspension of the homologous trypanosomes causes marked adhesion. If a wet preparation is kept under observation for several hours, it will be found that at first the trypanosomes tend to adhere to each other (agglomeration) and become attractive to the platelets which collect in vast numbers around them and finally completely bury them. At first the trypanosomes retain their morphological features, but little by little their protoplasm appears to be dissolved and finally only fragments of nucleus or flagellum can be recognised among the masses of platelets. It is suggested that the platelets give rise to a proteolytic ferment which dissolves the trypanosomes. This power of the plasma persists for long periods and is reinforced by reinfection. The phenomenon therefore appears to be part of and indicative of an immune process.

It appears reasonable to hope, therefore, that as the result of further research in this direction, a method of conferring a firm sterile immunity against trypanosomes by chemotherapeutic methods may be evolved. This will be of inestimable value. In Central Africa, alone, some four and a half square miles of potentially valuable country are rendered unsuitable for beneficial occupation and development by reason of the presence or menace of the tsetse fly. Every year millions of unfortunate natives and animals perish from trypanosomiasis. At present the Governments concerned place their confidence in, and heavily subsidise the entomologists who propose to eliminate the last pair of tsetse flies in this vast and often inaccessible area. While these enthusiasts are engaged in their formidable and necessarily protracted task, it might be profitable to seek some alternative method of dealing with this problem, and it would appear that, as in other diseases, it might be worth while to endeavour to render man and animals resistant to the infections transmitted by the tsetse fly. In the light of recent discoveries it appears that this might be achieved by chemotherapeutic methods and further research in this direction might be encouraged. If success could be achieved with the trypanosomes peculiar to Central Africa the principles might be found applicable to other forms of trypanosomiasis, such as surra, dourine, and mal de Caderas, which cause such serious losses in other parts of the world.

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# THE DEMONSTRATION OF A PECULIAR KIND OF COPROPHAGY NORMALLY PRACTISED BY THE RABBIT

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> "*Nevertheless these ye shall not eat of them that chew the cud, or of them that divide the cloven hoof; as the camel and the hare, and the coney: for they chew the cud, but divide not the hoof, therefore they are unclean unto you.*"
> —Deut. xiv, 7.

In June of last year, a letter appeared in *Nature* entitled "Does the Rabbit Chew the Cud?" from the Danish contributor Dr. Holger Madsen[3] who proceeded to answer the question in the affirmative. Coupled with this letter was an appendix by the author of the present note[7] reporting some observations made at this laboratory and confirming the surprising conclusions arrived at by Morot[4] in 1882, which had originally stimulated Madsen's enquiry. It is interesting, however, to be able to quote the earlier reference which, because of the unusual associations, is placed at the head of this paper.*

Unfortunately, Morot's early publication does not appear to be available in this country, nor have I been able to obtain Wille's abstract, referred to by Madsen; but according to Madsen's letter the conclusions reported by Morot in 1882 were that rabbits produce two kinds of faeces, a soft kind coated with mucus, produced at night, and the familiar harder and rougher kind produced during the day. The night faeces he found to be taken by the rabbit directly from the anus, and, without being chewed, to be swallowed like pills.

The observations carried out by Madsen gave results that supported these extraordinary statements; as, however, they appeared to leave room for alternative explanations, further enquiry was carried out at this laboratory and resulted in our conversion to the idea that the rabbit normally practises a very peculiar kind of coprophagy to such a surprising degree that half of the contents of a full stomach may consist of faecal material.

It is obvious that a knowledge of this unsuspected habit is of great importance to research workers using the rabbit as an experimental animal, and particularly in investigations involving the process of alimentation. On account of the importance that Morot's discovery may have in veterinary research, therefore, and because of the incomplete nature of the previous report, a full account of the author's observations is now made.

## Description of Stomach Pellets

The curious food pellets which occur in the stomach of both the wild and the tame rabbit must be familiar to anyone who has had the occasion to open the stomachs of rabbits, and the author has been used to finding them in the majority of rabbits examined during the course of work carried out on the stomach worm, *Graphidium strigosum*. Examination shows them to be of varying sizes ranging from 0·2 to 1·0 cm. in diameter, more or less spherical, soft in consistency and coated with mucus of such a tough nature as to permit of the pellets being picked out with forceps and stored in specimen bottles without any sign of their breaking down. Although a few pellets may occasionally be found mixed with the general stomach contents, they are usually massed together at the cardiac end where they may comprise up to one-half of the

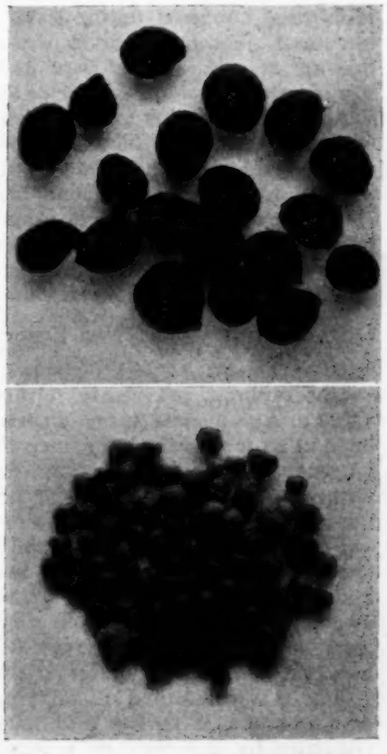

Fig. 1.

(*a*) Large, hard, dry faecal pellets formed during the day-time. These were taken from the colon of a rabbit killed at 10 a.m. Reproduced actual size.

(*b*) Smaller faecal pellets, of a softer and moister consistency, formed during the night. These were taken from the stomach of the same rabbit, probably having been swallowed during the early morning. Reproduced actual size.

*An interesting reference to the hare chewing the cud has been brought to my notice through a private communication from Professor Sir D'Arcy Thompson to Julian S. Huxley. The poet Cowper seems to have taken it as a matter of course, or of daily observation that his pet hares chewed the cud since he writes of one of them "he hid himself generally under the leaves of a cucumber vine, sleeping and chewing the cud till evening."—Cowper's Works, edited by Southey. Vol. IV, p. 423 (Bohn's edition).

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total contents and are so clearly separated from one another by their coating of mucus that they fall apart when shaken out of the stomach. In one instance the pellets were carefully picked out and found to weigh 45 grammes as against 53 grammes of stomach contents not in pellet form.

### Muzzling of Rabbits

The first observation to be carried out was on four muzzled and four unmuzzled rabbits, kept for 24 hours in individual cages fitted with wire mesh floors to catch the faeces. This was thought to be an improvement of Madsen's experiment in which a rabbit was fitted with a wooden collar to prevent coprophagy. On examining the eight cages in the morning, however, it was found that two kinds of faeces simulating the nocturnal as well as the diurnal kind had been passed by members both of the experimental and of the control groups of rabbits, so giving a result that appeared to be contrary to Madsen's.

### Examination of Stomach Pellets for Coccidia

The next step was to kill two rabbits previously found to be infected with coccidia, and to examine the stomach pellets and general mass of material in the stomach for coccidial oöcysts. Coccidial infestations of the rabbit are confined to the liver and to parts of the intestinal tract posterior to the stomach so that the finding of coccidial oöcysts in the stomach pellets would provide good evidence of their faecal origin.

As a result of this examination the stomach pellets were found to contain large numbers of coccidial oöcysts, which, though not so numerous as were found in an equal weight of rectal pellets from the same rabbits, were eight times as numerous as those in the general stomach contents. The few found in the general contents doubtless originated from the breaking down of some of the pellets.

### Observations after the Feeding of Lycopodium Spores

Observations previously reported have shown the value of *Lycopodium* spores in tracing the alimentation of food material (Taylor[6]) since they can subsequently be recovered through the employment of the ordinary flotation technique used for the concentration of nematode eggs.

Food containing some millions of *Lycopodium* spores was therefore given to two rabbits at 11 a.m., and left in their cages until 4 p.m., when it was taken away and an ample allowance of green food substituted. At 10 a.m., two days later, *i.e.*, 42 hours after their last access to *Lycopodium* spores, the rabbits were killed.

The result obtained on carrying out an examination of the stomach pellets and of the general stomach contents by flotation in a heavy salt solution and microscopical examination of the surface layer was similar to that obtained in the previous examination for coccidia, in that large numbers of spores were found in the stomach pellets and only very few in the general stomach contents.

### Observations on Rabbits in which Coprophagy was Prevented

Next in the series of observations came the tying of experimental rabbits into bags, leaving only their heads exposed so that, whereas they were able to eat in the normal way, all access to faecal material was prevented.

For this purpose it appeared necessary to ensure that the experimental rabbits should feed well while tied into their bags; nine rabbits were, therefore, fasted for 36 hours after which six of their number were tied into strong bags with only their heads projecting. Three other rabbits were kept as controls, and ample green food was given to all.

Eighteen hours later the rabbits were killed and the contents of the stomachs examined, whereupon the six experimental rabbits were found to be free from the pellet formation, nor could any trace of pellets be found on subsequent washing of the stomach contents in water. Furthermore, examinations of the stomach contents by the salt flotation method for the oöcysts of coccidia gave a negative result.

In contrast with these findings the stomach contents of the three control rabbits presented the normal appearance, approximately one-third to one-half consisting of the familiar soft, round pellets with the usual abundant coccidia content.

This last experiment appears to prove conclusively that the stomach pellets are of faecal origin and are not the result of some mechanical action of the stomach wall. The previous fast, however, and the liberal allowance of green food subsequently placed before them, and remaining there up to the time at which they were killed, made it appear highly improbable that the control rabbits had practised the kind of coprophagy common among ill-fed caged animals, and this consideration, along with that of the soft and smooth nature of the stomach pellets, suggested the operation of some special physiological process.

### Experiment with Rabbits kept on a Wire Netting Floor

The next point was to try to confirm the inference drawn from the preceding observations that the faecal pellets, which eventually find their way into the stomach, are taken by the rabbit directly from the anus, without having been allowed to reach the ground. For this purpose two rabbits were kept for 48 hours on a wire netting floor in an ordinary metabolism cage, the wire netting being of such a mesh that the faecal pellets fell through and became inaccessible to the rabbit.

At the end of the 48-hour period the rabbits were killed for *post-mortem* examination. The contents of their stomachs were then found to be perfectly normal, in that a considerable proportion consisted of the familiar pellets, so confirming Morot's original findings, and the implications of the experiments reported above, *i.e.*, that the rabbit takes the faeces direct from the anus and swallows them like pills.

### Experiment on the Time of Day or Night at which Coprophagy Occurs

It is by no means invariable that these pellets are found in the rabbit's stomach; in fact, it quite frequently happens that they are absent when search is made for them *post-mortem*, and at about this stage in the investigation their absence had been observed in a rabbit killed at 4 p.m. in connection with another experiment. It was, therefore, decided to make observations on rabbits killed at different times during the night, all of those used up to date in the present series of experiments having been killed

before mid-day, and all except the six special cases mentioned above having been found to contain pellets in their stomachs.

For this purpose observations were made on four rabbits which, after having received their normal morning's feed, were given a 24-hours' allowance of green food during the afternoon ; different individuals were then killed at 11 p.m. on the same day and at 2 a.m., 5 a.m., and 8 a.m. on the following day. On *post-mortem* examination of the first two—killed at 11 p.m. and 2 a.m. respectively—the stomachs were found to be free from any sign of pellets although both were full of food. On opening the large intestines, however, where it was thought that an accumulation of pellets might be found, ready for transmission to the mouth, the part below the caecum was seen to be empty, nor was there any trace of pellets in the caecum itself.

The *post-mortem* findings in the rabbit killed at 8 a.m. were disappointing, only a few pellets being found in the stomach, which, however, also contained a lot of soft material of a light green colour, bearing a close superficial resemblance to the soft material also found in the rectum and colon. This finding, it was thought, might be explained by a too-watery consistency of the faecal material which, in a drier state, would have been present in the form of the soft stomach pellets.

The rabbit killed at 5 a.m., however, gave a very interesting result, typical stomach pellets being found both in the stomach—at the cardiac end of which a large number were seen—and at the termination of the rectum just within the anus, where six pellets were found, apparently identical with those in the stomach. Higher up the large intestine were pellets of quite a different kind, larger, harder and drier ; and having a more uneven surface, similar to the familiar diurnal type of rabbit's faeces.

Presumably this rabbit had been killed at the time that coprophagy was being carried out.

## DISCUSSION

It is not necessary to go beyond this laboratory to find a very good illustration of the importance of Morot's conclusions to research workers who use the rabbit as an experimental animal. In a series of observations by A. Eden, the excretion of ingested copper in the faeces of a rabbit after an experimental feed was found to be spread over several weeks, although no pronounced storage in muscles, liver and glands could be demonstrated. The possibility that temporary storage occurred through loose fixation on the intestinal mucosa followed by surface exfoliation and elimination, was considered, but ruled out by analysis of the tract wall itself. Ultimately, the alternative explanation suggested by Taylor[7] proved to be the correct one and Eden[1] showed that refection of copper-containing faeces proved a complete explanation of the delay in " apparent rate " of excretion of the element. On attaching a collar to prevent coprophagy, ingested copper was eliminated in a few days and calculations from " real rate " of passage of copper through the tract in collared rabbits as compared with " apparent rate " in uncollared rabbits showed that in extreme cases over 80 per cent. of the daily solid excrement must have been refected.

Perhaps the most remarkable thing about Morot's discovery, which now appears to have been thoroughly substantiated, is its belated arrival. It would be interesting to know whether reasons are given in ancient Hebrew writings for the statement that rabbits chew the cud, and one hopes that it is not too presumptuous to think the supposition merely arose from the knowledge that the rabbit's stomach often contains pellets bearing some resemblance to the bolus of ruminal contents thrown up into the mouth by the ruminating animal.* Considering the keen interest taken in rabbits by fur farmers and fanciers, including the generations of boys who have watched their pets with eager curiosity, it is very remarkable that this pronounced habit should have completely escaped observation.

Coprophagy among experimental animals on restricted diets is a well-known phenomenon and may be regarded as a symptom of deranged metabolism ; in other words, it is a " pathological coprophagy " as opposed to the " physiological coprophagy " of which the rabbit provides the first example. In searching for its purpose one may suppose that the digestion of cellulose is concerned, through the zymotic action of bacteria in the caecum ; or, possibly, the building up of bacterial proteins, the products of which activities could only be utilised by the material being passed a second time through the small intestine.

Although the unnecessary introduction of a new term into scientific nomenclature is to be deplored, the requirements in the present instance appear to be so definite as to override all objections.

The physiological process seen in the rabbit may be regarded as an essential attribute of the species *Oryctolagus cuniculus*, just as the ruminating process is an attribute of *Bos taurus* : " coprophagy " is too wide a term, and, as applied to mammals, is suggestive of abnormality, nor does it convey any idea of the very specialised process of alimentation now seen to take place in the rabbit; "pseudo-rumination" is, therefore, suggested until more is known about the process and a better term is found. For the present it may be defined as a process of alimentation which involves a special rhythm of the caecum resulting in the production of two kinds of faeces, one of which is taken directly from the anus and reingested by the animal.

The question now arises as to the possible occurrence of pseudo-rumination in other species of animals, and in this connection, it is interesting to refer to a paper by Honigmann[2] who made some observations on the rate of passage of experimental feeds through the intestine of various animals and birds in the London Zoological Gardens. Among the 25 species on which observations were made the two-toed sloth *Choloepus didactylus* was found to have a remarkably slow rate of peristalsis, in that traces of the experimental feed were found in the faeces up to the 47th day.

Honigmann obtained evidence of foodstuff eaten

*According to Tristram[8] the rabbit does not occur in Palestine, although at least two species of hare do, and the " coney " of the Bible is thought to refer to the hyrax.

This same authority states that the Hebrew word for " rumination " merely means to " re-chew." Tristram also states that the flesh of the hare is highly esteemed by the Arabs, who assert that it is clean because it chews the cud, their limitation not extending to the other requisite of dividing the hoof. Taking Cowper's reference into account, it may be thought more probable, as suggested to me by J. S. Huxley, that the ancient Rabbis had merely observed the lateral movements of the jaws so frequently practised by hares and rabbits, and by most other rodents, to ensure adequate wear of their quickly-growing incisor teeth.

one week later than the test feed being ejected four weeks earlier than the last remains of that feed, and concluded that a considerable mixing takes place of foodstuffs eaten at different times, the various quantities of chyme passing each other in the intestine. It now seems possible, however, that this animal may have been carrying out the same process as has been observed in the rabbit.

It is unfortunate that rodents were not included among Honigmann's observations since some indication of the occurrence of pseudo-rumination among laboratory animals other than the rabbit might thereby have been obtained. Most of all is it desirable to secure this information in connection with the rat, on account of its extensive use by nutrition workers, and if this unsuspected factor is found to operate in this laboratory animal it is conceivable that some or even many experiments may have to be repeated.

Since the publication of the first note in *Nature*[7] a verbal report has come to hand from two independent sources of stomach pellets having been found in wild rabbits shot in the evening, but not in those shot in the morning, the converse of what is here reported to have been observed in caged rabbits. It seems not unlikely, therefore, that pseudo-rumination occurs during resting hours and not during the hours of active feeding; hence the tame rabbits feed during the day time because food is then placed before them by their keepers, and reingest it at night, or towards morning when their food supply may have run out, but in wild rabbits the operations are reversed on account of their habit of feeding at night.

An observation recently reported by Southern[5] is at variance with this view since, by means of a telescope, he was able on three occasions to observe wild rabbits taking faecal pellets from the anus during the early morning, but only once during the evening.

As yet, however, nothing is known about the mechanism governing the production of the two distinct kinds of faeces, those discarded during the day time and the softer kind produced at night; but presumably it concerns some intestinal rhythm the timing of which depends upon the feeding and resting periods of the individual.

### Conclusions

The small, round, soft, mucus-coated food pellets commonly seen at the cardiac end of the stomach of the rabbit are of faecal origin. They are taken into the mouth of the rabbit directly from the anus, without touching the ground, and are swallowed whole. The operation appears to take place in tame rabbits during the early morning but there is some evidence to suggest that in wild rabbits it is performed late in the day. This is a normal physiological process for which the term " pseudo-rumination " is proposed.

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## Coprophagy In the Rabbit*

Coprophagy in the rabbit was discussed by Madsen[2] and by Taylor[3] in *Nature* (1939) confirming earlier observations by Morot (1882)[1], the significance of which had been overlooked. These observations showed that rabbits normally pass two kinds of faeces, the ordinary familiar pellet type during the day, and a soft mucous type during the night, rarely observed because collected directly from the anus and swallowed. Taylor emphasised the necessity for recognition of this peculiar attribute of the rabbit in the correct interpretation of parasitological and physiological work in which the rabbit is employed.

Earlier observations at Weybridge[4] had shown that the elimination of copper when dried (as the sulphate) on to food was spread over five weeks. Less than half of 50 mg. copper so fed appeared in the faeces over the first seven days, and as other evidence was available that the retention of such large amounts of copper could not be due to absorption from the alimentary tract and storage within the body, the only rational explanation seemed to be refection of the copper-containing faeces. Calculation showed that to account for a 50 per cent. retention after seven days about 80 to 90 per cent. of the total faeces excreted must have been re-eaten, that is, four to nine times the amount actually passing through the wire-mesh floor of the cage. Refection to such a high degree seemed incredible even with an animal receiving a quantity of food below its maximum appetite level.

The experiment was therefore repeated. On this occasion 38 mg. of the 50 fed were voided within a week and the remaining 12 mg. were recovered from the tract (2·5 mg. in the stomach, 1 mg. in the intestines, 5 mg. in the caecum and 3·5 mg. in the rectum), while the wall of the tract and the soft tissues contained only the usual 0·2 to 0·5 mg. per cent. fresh material. The high amount of copper in the stomach afforded particularly strong evidence of refection, and calculation from the observed excretion of copper showed that, depending upon the time assumed for complete passage of food through the tract, about 50 to 70 per cent. of each day's rectal deliveries must have been reconsumed.

In a further experiment with a rabbit provided with a wooden collar, presumed large enough to prevent the animal getting at its anus, 50 mg. copper were again fed and the daily dry matter excretion studied. In a preliminary period, a daily average of 9·5 g. faecal dry matter, of the ordinary pellet type, was excreted over five days. After attaching the collar 37·5 dry matter appeared in typical " day " faeces and 17 g. in the softer night faeces, that is, 54·5 g. in all over the subsequent 24 hours. On the assumption that 9·5 g. would have been passed on this day also but for the collar, the appearance of 54·5 g. suggests that 45 g. (54·5—9·5) would have been eaten had the animal been able to get at its anus, a calculated refection level of 82 per cent. of the total excretion. The excretion of 50 mg. copper fed after the collar was attached was followed; 96 per cent. was recovered in

*Abbreviated form of an article " Coprophagy in the Rabbit," by A. Eden (Veterinary Laboratory, Weybridge) from *Nature*, **145**, 36 (1940).

four days, mostly on the second day (25·5 mg.). This presumably corresponds to the real rate of passage of food through the tract and is in striking contrast to the slow "apparent excretion" observed in rabbits allowed to practise their customary refection.

Excluding the first day of high faecal excretion after collaring, the average dry matter excreted over the next 15 days was 13·7 g. daily, 4·2 g. more than in the preliminary uncollared period. This at least suggests that refection increases the extent of digestibility of the dry matter of the food, and this has been borne out by independent digestion trials subsequently carried out. As showing the extent of the craving for faeces, the rabbit after twelve days discovered a cunning method of circumventing the collar and was observed to take occasional pellets from its anus during the day although it often rolled over in the process.

The collar was replaced by a larger one and again feeding 50 mg. copper with the food some 6·5 mg. Cu appeared within 24 hours, but only 4·5 g. dry matter. The collar was then removed. A further 36·5 mg. copper was recovered in the faeces in the ensung seven days, when on again replacing the collar practically all the remaining copper appeared in two days, during the first of which the faecal dry matter rose from 13 to 28 g. with the reappearance of "night" faeces. The drop from 13·7 to 4·5 g. on removing the collar and the rise from 13 to 28 g. gives refection figures of 67 and 54 per cent. respectively. Thus, although the degree of refection naturally varies with each individual rabbit, with the amount of food, probably with the chemical composition of the food and with disturbance of habit by intermittent collaring, quantitative determinations show that from 50 to over 80 per cent. of the faeces normally passing the anus are reconsumed. Taylor has described the difference in physical appearance of the two types of faeces. The chemical difference is even more marked.[5] Night faeces have a much higher content of nitrogen, total ash, phosphorus and potash and are much lower in fibre than day faeces, the ration fed being a standard one of bran and oats.

### References


[1]Morot, Ch. (1882.) *Mém. Soc. centr. méd. vét.* **12**, Sér. 1.
[2]Madsen, H. (1939.) *Nature.* **143**. 981.
[3]Taylor, E. L. (1939.) *Nature.* **143**. 981.
[4]Eden, A., and Green, H. H. Unpublished observations.
[5]Eden, A. Unpublished recent observations.


## TETANUS ANTITOXIN

"Some confusion may still exist owing to the two units employed for expressing dosage of tetanus antitoxin," observes the *Lancet* in a recent issue, and proceeds, "The international unit (I.U.), adopted by the Permanent Commission on Biological Standardisation, is now used in this and many other countries, whereas the American unit (A.U.) is still employed in the United States and elsewhere. The relation between A.U. and I.U. is 1:2. The routine prophylactic dose at the beginning of the last war was 500 A.U., and there was a tendency later to increase this to 1,000 or even 1,500 A.U. The memorandum issued by the Director-General of Emergency Medical Services (see *Lancet*, September 2nd, 1939, p. 578) recommends a prophylactic dose of about 2,600 I.U., equivalent to about 1,300 A.U., or some two and a half times the old routine dose."


THE VETERINARY RECORD

April 6th, 1940.


# BENEVOLENCE AND MUTUAL DEFENCE

IT is gratifying to note, from the report presented by the Hon. Treasurer to the Annual Meeting of the National Veterinary Benevolent and Mutual Defence Society—as recorded elsewhere in this issue—that the efforts made by its officers to increase the membership resulted in the achievement during the past year of the highest number attained in the Society's history. Particularly in the case of a benevolent society, however, it is essential that the membership be effective, *i.e.*, that each member should readily fulfil his obligations in the payment of his subscription, and in view of the evidence as to the value of this Society's activities afforded by the lists of defence cases and of beneficiaries, also published, we are sure that members will see to it that the handicap to its operations represented by the reference to "the list of arrears as a serious item" is removed forthwith. Is it too much to hope that, even under war-time conditions, a yet larger reduction may be made in the disproportion between membership of this Society, also of the Victoria Veterinary Benevolent Fund, and that of the veterinary profession in this country?

The benevolent work of both societies has to be maintained under difficulties in present conditions and both have to pay anticipatory regard, in this connection, to the sad aftermath of war. On this occasion, however, we would stress the benefits of membership revealed in the story of the uniformly successful assistance rendered to members threatened with legal proceedings, recounted in the section of the report devoted to "Defence."

We venture to express some wonderment that so small a profession can support two organisations dealing simultaneously with benevolence, and would suggest that the time is ripe for re-examination of the constitution of the respective societies.

## HIGHER AGRICULTURAL EDUCATION

The Ministry of Agriculture and Fisheries announces that the Minister has appointed a Committee to review the position of agricultural education at University Departments of Agriculture and Agricultural Colleges, as affected by war conditions, and to recommend from time to time such financial assistance from the Exchequer as may be considered appropriate, bearing in mind also the possible demand for higher agricultural education in the immediate post-war period. The following are the members: Dennis G. Brown, Esq., J.P., E. Salter Davies, Esq., C.B.E., M.A., Joseph Duncan, Esq., Anthony Hurd, Esq., C. Bryner Jones, Esq., C.B., C.B.E., T. Loveday, Esq., M.A., LL.D., and Professor John S. B. Stopford, M.D., F.R.S. Dr. Loveday, Vice-Chancellor of the University of Bristol, will be Chairman of the Committee and Mr. A. R. Whyte, of the Ministry of Agriculture and Fisheries, will be the Secretary.

## CLINICAL COMMUNICATION

### Strangulated Inguinal Hernia in a Bull

HENRY TAYLOR, F.R.C.V.S.,
Haywards Heath

The animal was a pure-bred Red Poll bull, about one year old, purchased because of his breeding, although it was known that he had an unusual swelling at the upper part of the scrotum. The agent of the purchaser in consequence of the swelling got a veterinary surgeon to examine the bull, his report being that it was a rupture but that it was caused " by a lump of fat and would never hurt him." Now it was known that the sire of this bull had no rupture, but his grandsire had and no trouble had been experienced in that respect. After the purchase was completed, the bull was put in a motor cattle truck and brought to the place of my client, some 60 miles distant. During the journey he was a little troublesome and when being unloaded he plunged about a good deal. The latter exertion made the swelling much larger and my advice was sought.

On examination, the swelling was seen to occupy the region where the upper part of the scrotum, on the left-hand side, joins the body. It was about the size of one's fist, rather oedematous and a little painful. Appropriate treatment lessened the swelling and in a few days the bull recovered sufficiently to be used for stock purposes. My opinion as to the gravity of the rupture did not quite coincide with that of the above-mentioned veterinary surgeon in view of the effect of the bull's plunging about; it seemed rather too optimistic, notwithstanding the knowledge of his grandsire's freedom from trouble. Anyhow the bull was used for serving cows for six months without untoward results.

One morning, however, he was turned out into a covered yard with a cow in oestrum for stocking and a few hours afterwards was found to be in great distress, trembling and in pain with the inguinal hernia much swollen. My advice was sought and anodynes, local and general, were prescribed. Next morning he was not much better and was passing blood by the anus. The following day two colleagues (Messrs. Dier and Marks) were called in consultation and we tried to reduce the hernia by passing the right hand into the rectum and then down the left flank of the bull towards the internal abdominal ring. Here the swollen bowel could be felt but no ordinary traction could release it. Castration seemed out of the question, so the only course was to have him slaughtered. On *post-mortem* examination, the piece of bowel in the inguinal canal was seen to be much swollen and congested, with a tear about 2 inches long.

#### Remarks

Inguinal hernia in the bull must be rare: this is the first case I have seen in the many years I have been a practitioner. The authorities have little to say on the subject. Moller's Veterinary Surgery, 1895 edition, says, " Inguinal hernia is rare in ruminants and only a few recorded cases exist." Mention is made of Löblé's method of operating through the right flank, cutting through the skin and muscle below the external angle of the ilium, passing the hand into the abdominal cavity, enlarging the abdominal ring with a bistoury and freeing the bowel. Then the abdominal wound was sutured. Williams, in his " Veterinary Surgery," does not mention the condition, and Professor Wooldridge, in the " Encyclopaedia of Veterinary Medicine and Surgery," simply says, under the heading " Hernia in the Ox," that it is much less common than in the horse, while Moussu and Dollar in " Diseases of Cattle, etc.," make no mention of it.

## ABSTRACTS

**[THE FATE OF COPPER IN THE BLOOD STREAM.** Eden, A., and Green, H. H. (1939) *J. comp. Path.* **52.** 301-315. (11 tab., 2 figs., 12 refs.]

Few studies have been made on the fate of copper injected into the blood stream of animals since the accurate estimation of blood copper has been feasible only within the last few years. In the experiments described a modification of the sodium diethyldithiocarbamate method was used. The Cu salt employed for injection was the sulphate. Experiments were carried out on rabbits and sheep.

After injection of Cu there is an immediate rise of blood Cu, followed by a rapid distribution through all the tissues, and almost normal blood values are reached within five hours after a non-fatal injection. The rate of disappearance is proportional to the excess above normal at any given time. In normal blood of sheep and cattle, the Cu content of the cells and plasma is approximately the same. After injection of Cu, the plasma level is at first higher than that of the whole blood and the rate of disappearance is also higher; when equilibrium is established between cells and plasma the rate of disappearance is about the same. With very large doses the rate of fall for the plasma is at first higher and, thereafter, slower than for the whole blood. Cu appears to penetrate the corpuscles or be adsorbed on them and to be somewhat firmly retained.

The upper non-fatal level of blood Cu appears to lie between 1·2 and 1·6 mg. per cent., or about ten times normal. The minimum lethal intravenous dose is about 1·5 mg. per kg. body weight. After injection of fatal doses, death occurs in a short time with symptoms of paralysis and respiratory failure.

When high doses are given orally in the rabbit, the blood Cu value rises to levels representing the balance between the rate of absorption into the blood and disappearance from it, relatively high maxima being reached in a few hours. If the Cu solution is dried on food, large quantities of Cu can be ingested daily without any appreciable rise in blood Cu content.

The anthelmintic dose of 1 gramme copper sulphate in 100 c.c. solution causes no rise in blood Cu.

A. T. C.

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**[TREATMENT OF CHRONIC LAMINITIS.** (Trans. title.) Bolz, W. (1939.) *Tierärztl. Rdsch.* **45.** 651-6.]

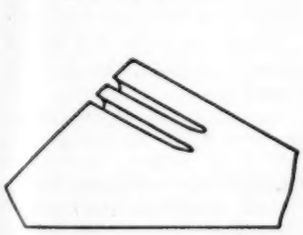
This paper is of unusual interest because it is based on experience of 60 cases treated within three years, a very large number for one man to be called upon to

treat in such a short time. As a result the method of treatment adopted was tested thoroughly and the results and conclusions carry much weight.

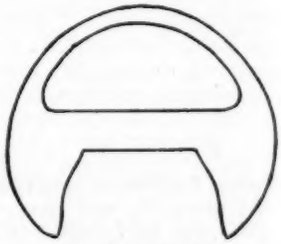
The great majority of this series of cases was observed in the summer and autumn of 1937 in the vicinity of Giessen. In that year the oat harvest was very poor and horses were given other grain (wheat, barley and rye) and new-mown hay or cereal. Bolz regards this as the cause of the laminitis.

The pathogenesis and treatment of founder are discussed and the literature reviewed. While there is general agreement about the nature and mechanism of the characteristic hoof deformity which develops, Bolz introduces a new plan for treatment which is calculated to restore the displaced coffin bone to its normal position in close contact with the anterior wall of the hoof.

Bolz argues that in the normal foot the coffin bone is suspended by means of the laminar matrix from the front wall of the hoof. This union is lost in laminitis and the weight formerly sustained by the front wall is transferred to the coronary cushion alone. The cushion is therefore compressed and ceases more or less to secrete a normal hoof wall in front, though it is less affected at the sides and heels (the clinical sign of this is the divergent ring hoof formation in chronic laminitis). The task of treatment is therefore twofold—to replace the downward-rotated coffin bone in relation to the hoof and to correct matters for the coronary cushion by removing the excessive pressure in front. The damage done by the acute laminitis is ignored and full attention given to effecting a new start in hoof wall formation. This part of the work is done by cutting two deep horizontal grooves across the anterior semicircle of the hoof, the top one as high as possible where the wall has reached its full thickness and the second one 1·5 cm. below, the grooves to diverge slightly as well as decreasing in depth as they extend on each side. To support the coffin bone and to prevent it perforating the sole a special bar shoe is fitted, the hoof being prepared by rasping off the toe and cutting flat the apex of the frog where the bar is to fit (see Figs.).



Hoof Treatment.



Special Bar Shoe.

The shoe is high at the toe and low at the heels but worked so as not to be very toe-heavy. The effect of the special shoeing is to throw the weight on the heels, bars, frog and rami of the sole. The shoe is removed every four to six weeks to enable the hoof to be kept in good shape (chiefly by shortening the heels).

The cure is of course not absolutely complete until there is a complete new wall grown (nine months) but the horses can be worked long before that has taken place.

Bolz treated 54 horses in this way and had 38 complete cures, three improvements and three failures—the rest not being judged, for various reasons.

J. E.

**[INTRA-CAPSULAR FRACTURE OF THE FEMUR IN A HORSE..** (Trans. title.) Dunemann. (1939.) *Z. Veterinärk.* **51.** 170-175.]

A case, the subject of which was a five-year-old gelding, which exhibited complete lack of co-ordinated movement in the off-hind limb and slight crepitation in the region of the hip joint, was diagnosed as suspected fracture of the neck of the femur although no definite break could be palpated. Four months' treatment with rest, calcium lactate and vigantol intravenously was of no avail.

*Post-mortem* examination revealed an intact capsular ligament, and although the articular head of the femur had become completely detached from the shaft, it was still attached to the acetabulum by means of the ligamentum teres and had thus been prevented from penetrating the capsular ligament. The articular surfaces were normal, but the sulci, acetabular rim and surrounding portion of the innominate bone showed areas of exostoses.

The author suggests that intra- and extra-capsular fractures should be clearly differentiated. In the former there is no shortening of the leg or apparent displacement of the skeletal structures, and, therefore, a certain amount of weight can be borne on the limb. In the latter the leg is usually shortened, external manipulation or rectal examination may reveal the site of fracture, and weight cannot be borne on the limb.

C. W. O.

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**[THE COLIC PROBLEM.** (Trans. title.) Gratzl, E. (1939.) *Tierärztl. Rdsch.* **45.** 207-13.]

In this lecture to the Veterinary Society of Vienna Gratzl deals with the causes, intestinal symptoms and treatment of colic in horses.

He states that the four factors—diet, mechanical trauma, chills and morphology of the gastro-intestinal tract—cannot be reckoned as causes of colic, but may be of secondary importance. Evidence that certain foodstuffs give rise to colic is often contradicted by the experience of different persons; for instance, Weischer claimed to have incriminated chopped straw as a common cause but Gratzl himself was unable to support him after observations on hundreds of horses to which chopped straw was given or from which it was withheld.

Weather changes seem to be an inciting cause of colic, according to many German veterinary surgeons, but the way in which they operate is not enlarged upon.

When the incidence of colic among large studs of working horses is studied from case histories the tendency to repeated attacks in certain horses is striking: thus in a group of 1,710 horses there were 1,709 colic cases in five years, 805 horses being involved. One horse had colic 31 times.

It is well known that strongylosis predisposes to colic: research suggests that the lesions caused by the larvae involve the arterial wall and nerve supply of the gut with the result that the sympathetic-parasympathetic control is unbalanced and the intestine can no longer respond to physiological stimuli.

The author lays great stress on the importance of intestinal cramp in the pathogenesis of colic. He distinguishes two main forms: cramp-peristalsis—which is essentially nothing but very energetic peristalsis and is always followed by defaecation and recovery—and tonic intestinal cramp, which is localised to short lengths of the intestine, commonly in the region of

sphincters (pyloric, ileal, caecal) and causes serious stoppages, obstructions and tympany.

If this theory is supported it follows that the practice of treating obstructive colic by drastic purgatives is contra-indicated and it is not true that intestine is essentially atonic and needs stimulating.

Gratzl recommends anti-cramp therapy, for which purpose the most active drug is atropine, but it has a too-prolonged paralytic action on the intestinal muscle. A better remedy is " Novalgin " made by the Farben-industrie firm : it is best given intravenously in cases of tympany and obstruction, except of course when the basic cause is a twist, incarceration or calculus.

Another good treatment consists of gastric irrigation with cold water, which is held to act on the whole intestinal tube by its presence in the stomach.

Novalgin or gastric irrigation will, it is claimed, cure most cases of simple tympany or obstruction when given early.

J. E.

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**[A DOUBLE STOMACH TUBE.** (Trans. title.) Kröll. (1939.) *Berl. tierärztl. Wschr.* No. 33. 522.]

In view of the fact that ordinary stomach tubes tend to become blocked with ingesta and so fail to relieve cases of tympany of the rumen, Kröll has had the idea of inserting through the standard type of tube a spiral wire tubing made so as to allow the passage of gas between the wire strands when the tubing is bent.

For the relief of bloat this wire tubing is inserted far beyond the end of the stomach tube so that it lies in loops in the rumen. In theory the result is that the tubing is constantly in motion and free gas passes into it and so to the outside.

The author evidently believes that part of the tubing is sure to lie high up where the gas collects, but no practical evidence of this is forthcoming and no case records are given.

J. E.

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**[INDICATIONS FOR PASSIVE AND ACTIVE IMMUNISATION AGAINST TETANUS.** (Trans. title.) Gelz, H. J. (1939.) *Tierärztl. Rdsch.* **45.** 424-427..]

The author discusses the various methods of immunisation against tetanus and the indications for their use.

In particular cases where operations are being performed on horses in known tetanus districts the method advised is to produce an active immunity by the injection of toxoid three weeks prior to the operation, followed by another injection at the time of the operation. The risk of tetanus following war wounds is mentioned and the method that has been used in the French Army for some years is recommended. This consists of the production of active immunity by injection of toxoid at the time of purchase. This provides a large number of horses which can be utilised for subsequent production of antiserum as well as acting as a safeguard against wound infection.

In addition to the prophylactic use of tetanus antiserum and tetanus toxoid the author describes the method of simultaneous passive-active immunisation. This is advised in the treatment of severe wounds which may take some considerable time to heal. The procedure adopted is the simultaneous injection of antiserum and toxoid at the time when the injury is sustained. The effect is the production by means of the serum of a transient passive immunity which is replaced by the active immunity produced by the toxoid. If it is thought necessary a second injection of toxoid may be given three weeks after the first. The resulting immunity may be considered as adequate to prevent the occurrence of the disease for at least one year.

W. M. H.

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**[THE EFFECT OF A PHOSPHORUS DEFICIENCY ON THE PROTEIN AND MINERAL METABOLISM OF SHEEP.** Morris, S., and Ray, S. C. (1939.) *Biochem. J.* **33.** 8. 1209-1216 (9 tabs. 28 refs.).]

Four sheep, all of approximately 14 months of age, were subjected to a feeding trial extending over 20 weeks. The basal P-deficient diet employed consisted of beet pulp, starch, blood meal and straw, and was fed unsupplemented for the first six weeks of the experiment ; it had a $CaO : P_2O_5$ ratio of about 5 : 1. During the second six weeks a supplement of $Na_2HPO_4$ was added reducing the Ca : P ratio to 1 : 1. In the third six-weeks' period the diet was further supplemented by the addition of $CaCO_3$ ; this restored the Ca : P ratio to 5 : 1, although both elements were now present in amounts greater than normally required. For the final fortnight of the experiment both supplements were withdrawn.

During the P-deficient periods, the food intake was diminished, and there was a lowering of the true digestibility of the dietary protein. The urinary total N was increased in these circumstances, but this could be ascribed to ingested protein, since the products of endogenous metabolism, *viz.*, creatine, creatinine, purine bases and sulphur, were lowered. The authors conclude that the primary effect of a diet deficient in P is a slowing-down of tissue formation, with consequent deamination and excretion of excess amino-acids. They suggest that the decreased protein digestibility is probably the result of a diminished secretion of digestive juices and enzymes, which appear to utilise P in their reactions.

The weight-increases recorded during the period in which there was adequate P and a Ca : P ratio of 1 : 1 were superior to those recorded during the period in which both Ca and P were present in adequate amounts but in the ratio of 5 : 1. Losses of both Ca and P occurred during the P-deficient periods, the urinary Ca rising from 0·5 to 5 per cent.

A. N. W.

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**[THE FASTING METABOLISM OF RUMINANTS.** Morris, S., and Ray, S. C. (1939.) *Biochem. J.* **33.** 8. 1217-1230. (8 tabs. 27 refs.).]

Extensive blood, urinary and faecal analyses were made during periods of fast in two lactating and two non-lactating goats, in four non-lactating sheep, and in four lactating cows. Prior to the commencement of the fasting period, the duration of which was ten or twelve days in the case of the cows and goats and six days in the case of the sheep, all the animals are stated to have received a ration complete in all respects for their requirements.* One goat died at the end of ten days, and one cow suffered an attack of " milk-fever " on the third day of the fast, but recovered following mammary inflation.

The observations were concerned chiefly with the nitrogenous metabolism. The daily urinary N excretion per kg. body weight, and the daily faecal N output were found respectively to be : for cows,

0·06-0·08 g. and 6·6 g.; for sheep, 0·12-0·16 g. and 0·49-0·80 g.; for goats, 0·12-0·20 g. and 0·35-0·50 g. The changes in the urinary N partition noted during the course of the fast included a rise in creatine N. Both the protein N and the N.P.N. of the blood rose during the fast. High values for protein N and for glucose were noted in the blood of the cow during the attack of milk fever.

The urinary and faecal excretion of Ca and P was determined in the case of the sheep and goats. Ca excretion by both routes was found to fall, whereas in the case of P, there was a rise in the urinary but a fall in the faecal excretion. The authors are of the opinion that catabolism of osseous tissue in ruminants does not occur even in fasts of 12 days' duration.

A. N. W.

[* The somewhat contradictory statement is made later in the paper that the sheep were receiving a P-deficient diet during the pre-fast period. A tabular representation of certain recalculated values, to which the authors refer in the text, would have enhanced the value of this paper.]

## ACETATES AND SULPHANILAMIDE

"Englehart demonstrated fifty years ago that the animal body protects itself against aniline by acetylating it into the comparatively harmless substance known as antifebrin, and acetylation is now known to be one of the means used by the body of taking the sting out of other poisons, the acetyl group being obtained from acetates, lactates or pyruvates in the body," states the *Lancet* in an annotation appearing on January 20th. It continues: "James[1] has studied in mice the toxicity and therapeutic activity of sulphanilamide when an acetate is given at the same time. Two groups of ten mice were used, A and B. First 10 mg. of sulphanilamide was given by mouth to each mouse daily for four days, group A receiving the drug alone and group B 10 mg. of sodium acetate daily as well. For the next three days no drugs were given and then group A received sulphanilamide and acetate whilst group B received sulphanilamide alone. After three days' rest all the mice were killed. Analyses of the urine showed that the administration of acetate did increase the amount of the acetyl derivative formed. Next five separate experiments were carried out each with three groups of mice infected with lethal doses of group A haemolytic streptococcus. One group served as control; the others received five small doses of sulphanilamide, one group with and the other without acetate. The average life of the mice was 2·2 days for the controls, 10·6 days with sulphanilamide alone and 10·4 days with sulphanilamide and acetate. Further experiments with large doses showed that acetate much reduced the acute toxicity of the drug. The spasticity, inco-ordination and hyperventilation described by Hoare[2], which were readily produced by sulphanilamide alone, were either absent or much less if acetate was given as well. Acetate did not seem to be of any value in averting chronic toxic effects. Since sodium acetate produced alkalosis, ammonium acetate was tried instead, with rapidly fatal results, due presumably to the known toxicity of the ammonium ion. Acetyl-sulphanilamide itself was found to be distinctly more toxic than the free substance, a fact which had been previously observed by Marshall and others.[3] This disturbing fact shows that the protective action of acetates, although apparently due to acetylation of the base in the body, is not as simple as might be supposed."

[1] James, G. V. *Biochem.* J. (1939.) **33**. 1688.
[2] Hoare, E. D. *Lancet.* (1939.) **1**. 76.
[3] *Science.* (1937.) **85**. 202. *J. Amer. med. Ass.* (1938.) **110**. 252.

## REPORT

[**DEPARTMENT OF AGRICULTURE, CANADA.** Report of the Veterinary Director General for 1939.]

During a reorganisation of the Department of Agriculture in 1937, the old Health of Animals Branch, which consisted of three Divisions, was rearranged; its Pathological Division was transferred to the Science Service and its Contagious Diseases and Meat Inspection Divisions became the present Health of Animals Division of the Production Service. This report deals with the work of the latter Division and is comprised for the most part of tables of statistics and orders relating to the incidence and control of infectious diseases.

There were two notable retirements from the Division during 1938, *viz.*, Dr. George Hilton, the previous Director General, and Dr. Robert Barnes, Chief of Meat Inspection. Both were men of international reputation and their retirement at the same time placed a considerable strain on the staff during 1939. The present Director General is Dr. A. E. Cameron.

The principal diseases of Canadian animals are tuberculosis (of which the incidence, compared with this country, is relatively low), Bang's disease and equine encephalomyelitis, and the staff of the Division have been engaged principally in preventing and eradicating these. Tuberculosis is being gradually reduced by a triple scheme of eradication and control, known as Accredited Herd Plan, Supervised Herd Plan and Restricted Area Plan respectively. In the first, animals reacting to the tuberculin test are slaughtered with compensation and during the year 306,079 animals were tested and 2,291 reactors slaughtered. To enter this plan herds must have passed two clean tests with an interval of a year or three clean tests with intervals of six months. The Supervised Plan is for herds which cannot qualify for the Accredited Plan. The same methods of procedure are adopted, however, except that compensation is not paid for reactors. The Restricted Area Plan provides that an area, usually a county or other well-defined district, is gazetted for eradication purposes when two-thirds of the stock-owners in the area petition for it. Tuberculin testing then becomes compulsory for all cattle in the area and compensation is paid for reactors. There were 1,101,073 tested during 1939 and $325,434 were paid in compensation for 10,784 reactors. Under the scheme considerable progress is being made in the establishment of tubercle-free cattle in most of the Provinces. The tables of statistics outlining this are very striking. Bang's disease control is of a voluntary kind and some 2,000 herds were under control during the year. The owners are required to employ a veterinary surgeon to collect and forward blood samples for testing by the department and when a herd has remained free of reactors for a year a check test is made by an inspector of the Division and the herd is then listed as a Bang's disease-free herd. Equine encephalomyelitis is being controlled by check embryo-culture vaccine with satisfactory results. Immunity lasts for one season at least and possibly longer.

Cattle for export to Great Britain are isolated and kept under supervision for 24 hours before embarkation. There is no foot-and-mouth disease in Canada and very strict precautions are taken to keep it out.

W. K.

## National Veterinary Benevolent and Mutual Defence Society

### ANNUAL GENERAL MEETING AT MANCHESTER

The Annual General Meeting of the above Society was held at the Grand Hotel, Aytoun Street, Manchester, on the afternoon of Wednesday, February 28th, 1940.

Mr. W. Woods, F.R.C.V.S. (President), occupied the Chair, and there were also present Messrs. G. H. Locke, J. Holroyd, E. H. Curbishley, J. F. Craig, A. J. Wright, J. H. Wright, J. W. Wilson, H. R. Hewetson, C. T. Trevers, H. D. Heggarty, E. W. Prescott, H. Holroyd, C. F. Shawcross, T. Scott Anderson, F. Hopkin (Hon. Treasurer) and R. C. Locke (Hon. Secretary).

Apologies for inability to attend were received from Messrs. F. L. Gooch, W. Jackson Young and A. H. Watson.

The minutes of the last Annual General Meeting, having been printed in *The Veterinary Record*, were taken as read.

#### Election of Officers for 1940

*President.*—Mr. William Woods, Wigan.

*Vice-President.*—Mr. G. H. Locke, Manchester.

*Council.*—Messrs. A. J. Wright (Macclesfield), J. Holroyd (Blackburn), J. H. Wright (Manchester), E. H. Curbishley (Alderley Edge), D. Imrie (Glasgow), H. Sumner (Liverpool), F. L. Gooch (Stamford), W. Shipley (Great Yarmouth), G. Mayall (Bolton), A. Cornish Bowden (Beckenham), O. V. Gunning (Acle), W. K. Townson (Peterborough), H. W. Dawes (West Bromwich), W. D. Rees (Glamorgan), R. Barons Nelder (Exeter), A. H. Watson (Bradford), Professor J. F. Craig (Liverpool), and C. F. Shawcross (Altrincham).

*Hon. Treasurer.*—Mr. F. Hopkin, Knutsford.

*Hon. Secretary.*—Mr. R. C. Locke, Manchester.

*Auditors.*—Mr. J. Adamson (Honorary), and Messrs. Litton, Pownall, Blakey and Higson.

#### Financial Report

The Hon. Treasurer, presenting his annual report, remarked that the outlook for societies such as this one was not so bright in view of the present world conditions. Interest on investments was slowly coming down, and the income showed a reduction of £20. Donations were less, and it was probable that a further reduction would have to be faced this year, particularly those received from canine societies.

The grants made to beneficiaries practically equalled the income of the Benevolent Fund. On the other hand, a further £500 had been transferred from the Defence Fund to the Benevolent Fund in accordance with rule, and this had been invested along with donations, etc. The membership had risen during the year to the highest number ever attained in the society's history—namely, 467—despite a number of deaths and resignations. Subscriptions, however, were not coming in as they should, and the list of arrears was a very serious item for the Society. Many new members, said Mr. Hopkin, paid the entrance fee and initial subscription and then proceeded to fall in arrear. Many others changed their address and failed to notify the Hon. Secretary, thus causing needless expense in tracing them up.

The Defence side had been very active during the year although no case had actually been fought in the courts. Considering the possibilities of some of the cases, the cost to the Society had been comparatively small.

On the proposal of Mr. J. Holroyd, seconded by Mr. E. H. Curbishley, the report was adopted unanimously.

Mr. G. H. Locke gave some particulars relating to the procedure necessary for incorporating the Society as a Company, but stated that, in view of the cost involved, he did not recommend incorporation at the present time. It was decided that no action be taken.

The meeting closed with a vote of thanks to the President for his conduct of the proceedings.

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#### Defence Cases

1. Counter claim against member for alleged negligent treatment of dog. Amicable settlement made. Society paid member's costs.

2. Action threatened for negligence in operation. Society assisted member. Claim not proceeded with. Society paid member's costs.

3. Threatened counter claim against member when pressing for fee for destroying dog. Society supported member—claim dropped.

4. Threatened claim against member alleging that dog had contracted distemper whilst in kennels. Advice given. No further development.

5. Dispute following operation on bitch. Society supported member. No further development.

6. Threatened claim following death of a puppy. Advice given. No further development.

7. Threatened claim against member following death of cattle. Advice given. Case still proceeding.

8. Threatened claim against member following death of thoroughbred. Society supported member. Case not proceeded with. Society paid member's costs.

#### Beneficiaries

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| M.J. | 89 | Widow | ... | ... | £2 | 0 | 0 | per month. |
| L.H. | — | 4 Children | ... | ... | £4 | 0 | 0 | „ „ |
| M.D. | 66 | Widow | ... | ... | £3 | 10 | 0 | „ „ |
| E.B.C. | 57 | Widow | ... | ... | £2 | 0 | 0 | „ „ |
| M.A. | 44 | Widow | ... | ... | £2 | 10 | 0 | „ „ |
| M.B.B. | 76 | Daughter | ... | ... | £2 | 0 | 0 | „ „ |
| A.J.P. | 68 | Widow | ... | ... | £2 | 0 | 0 | „ „ |
| L.M.R. | 44 | Widow | ... | ... | £4 | 0 | 0 | „ „ |
| K.L.H. | 87 | Widow | ... | ... | £2 | 0 | 0 | „ „ |
| A.E.P. | 62 | Widow | ... | ... | £4 | 0 | 0 | „ „ |
| P.V. | 85 | M.R.C.V.S. | | ... | £2 | 0 | 0 | „ „ |
| F.J. | 47 | Widow | ... | ... | £4 | 0 | 0 | „ „ |

R. C. Locke, *Hon. Secretary.*

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Allocation by the Ministry of Food of fixed monthly reserves of feeding stuffs intended to ensure the maintenance of good class pig and poultry breeding stocks is commended by the British Pig Producers' Council. They fear, however, that it will have little effect in encouraging breeders to preserve their stocks in the continued absence of demand for breeding animals consequent upon the control prices for fat pigs, which are described as "disastrous." Every effort should be made, say the Council in a statement, to end wasteful slaughter of the pig population by means of a price increase.

# IN PARLIAMENT

The following are among the questions and answers recently recorded in the House of Commons:—

## Centralised Slaughtering (Meat Inspection)

Mr. Salt asked the Minister of Food, in connection with the centralisation of slaughtering, what arrangements have been made to ensure adequate meat inspection at the various slaughterhouses; and whether he is now satisfied that the arrangements are sufficient to safeguard the interests of public health?

Mr. Lennox-Boyd: Inspection of meat in the interests of public health is the responsibility of local authorities and no change in that arrangement is contemplated. The managers at all slaughterhouses operated in connection with the control of meat and livestock have been instructed that the usual notifications of impending slaughtering arrangements must continue to be made to the officials of local authorities and that every facility must be afforded to those officials in their work of meat inspection. So far as I am aware the inspection of meat and livestock by the local authorities is being conducted efficiently, as in normal times, and is adequate to safeguard the interests of public health.

Mr. Salt asked the Minister of Food what is the present composition of that section of his staff dealing with meat inspection; whether arrangements have now been made to strengthen and enlarge this staff so as to deal adequately with the new problems which have arisen through the centralisation of slaughtering; and what is their nature?

Mr. Lennox-Boyd: Arrangements for the formation under the Ministry of Food of an inspectorate to cover the working of the meat scheme as a whole from slaughterhouse to distribution depot are in hand. Part of the duties of the inspectorate will be to ensure that proper steps are taken to avoid deterioration in the condition of meat. As regards inspection of meat in the interests of public health the Ministry have secured the services of Mr. L. B. A. Grace, M.R.C.V.S., D.V.S.M., formerly chief veterinary officer of the Corporation of the City of London, to advise the Ministry on general questions arising out of the health inspection of meat and to co-operate with local authorities in such matters. Arrangements are well advanced for a small number of officers to be added to this section of the Ministry's staff.

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## Meat Rationing

Mr. Boyce asked the Minister of Food whether he will make a statement on the working of meat rationing, saying what complaints he has received?

Mr. Lennox-Boyd: The first week of meat rationing worked smoothly on the whole. A few cases of shortages of supplies were reported, but steps were taken immediately to provide additional supplies. In general, these difficulties were due to the inability of the butchers concerned to notify earlier the local food control committees of the full numbers of their registered customers.

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## Animal Feeding Stuffs

Mr. De la Bere asked the Minister of Food whether, with a view to expediting the solution of the problems and difficulties in connection with the distribution of feeding stuffs throughout the country and separating the control which still continues to be exercised by the leaders of the milling combines, the Government will consider acquiring immediately these undertakings?

Mr. Lennox-Boyd: I do not think that the adoption of my hon. Friend's suggestion would facilitate the distribution of feeding stuffs.

Mr. De la Bere: Is my hon. Friend aware that the matter cannot be lightly dismissed, that indeed it cannot be dismissed at all; and is he further aware that one central and vital fact remains, that you will never get the feeding stuffs problem solved as long as the milling combines remain under their present control?

Mr. Lennox-Boyd: I would point out to my hon. Friend that they are not under their own control, but that under the Order they are under the control of the Ministry of Food. Any change such as my hon. Friend suggests would substitute for management by people who know the job, management by officials who do not.

Mr. De la Bere: Will the Ministry of Food really control these people? It is an absolute scandal.

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## Pigs (Ear-Marking)

Lieut.-Commander Tufnell asked the Minister of Food whether, in connection with the marking of pigs, he can state what alternative methods of marking have been put up to him and rejected by his Department; and whether, if the actual weight of the pigs was settled before they were killed and then payment made, there would be any necessity for marking the animals at all?

Mr. W. S. Morrison: Before deciding upon the ear-marking method which is at present in use, my Department considered the following alternative methods of marking: ear-tabs, flesh-marking, scissors clip (in the hair) and paint mark. In the light of practical experience in the use of these types of mark, they were rejected as unsuitable for the purpose in view, *i.e.*, the identification of ownership of pigs after passing through the various factory processes to which the carcases are subjected before weighing. As regards the last part of the Question purchase by live weight might avoid the necessity for an identification mark of the type referred to but there are serious practical and administrative difficulties in the adoption of such a course.

Mr. Hannah asked the Minister of Food whether his attention had been called to the cruelty caused by the present method of marking pigs by puncturing their ears; and will he take steps to use some more humane plan?

Mr. Lipson asked the Minister of Food whether he is aware of the cruelty practised on pigs by the Order under the grading scheme which permits the boring of the animal's ears by an instrument resembling a pair of large nutcrackers containing 15 to 20 steel pins; who was responsible for authorising this cruel procedure; and will he take immediate steps to prohibit it?

Mr. Riley asked the Minister of Food whether, in view of the strong objection to the present method of punching holes in the ears of live pigs in connection with the Government's grading scheme, he will instruct his experts to consider some alternative method of marking, or some modification of the present method?

Mr. Lennox-Boyd: I would refer hon. Members to the answer given to the hon. Member for South Kensington (Sir W. Davison) on March 14th, to which I have nothing to add.

Mr. Edmund Harvey: Will my hon. Friend expedite the use of some less cruel method?

Mr. Lennox-Boyd: I think the outcry has been considerably exaggerated.

Mr. Lipson: Is my hon. Friend aware that the previous answer to which he has referred caused widespread indignation, and that these Questions have been put down in order to persuade the Minister to change his attitude? Will not my hon. Friend consider some more humane method?

Mr. Lennox-Boyd: I think the indignation is really based on insufficient knowledge of the situation and a failure to realise that as long as pigs are bought on a carcase weight basis, some marking which will stay all through the processing is essential.

Sir William Davison: Does my hon. Friend realise the scandalous conditions at these markets, where the animals rush about bleeding?

Mr. Lennox-Boyd: Not even my hon. Friend could stop pigs squealing.

Mr. De la Bere: Why not have the pigs bought on a live-weight basis?

# NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

### Diary of Events

April 8th.—N.V.M.A. Committee Meetings.
April 9th.—N.V.M.A. **Council** and Committee Meetings.
April 11th.—R.C.V.S. Committee Meetings.
April 12th.—R.C.V.S. **Council** Meetings.
April 12th.—Annual General Meeting of the Southern Counties Division, N.V.M.A., at Winchester, 2.30 p.m.
April 15th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 4 p.m.
**May 9th.—Last date for nominations, R.C.V.S. Council Election.**
May 15th.—Commencement of R.C.V.S. Animal Management Examination.
**May 23rd.—Issue of R.C.V.S. Annual Report and Voting Papers.**
**May 30th.—Last date for receipt of R.C.V.S. Council Election Voting Papers.**
**June 6th.—R.C.V.S. Annual General Meeting.**
Victoria Veterinary Benevolent Fund Annual General Meeting.
June 20th.—R.C.V.S. Committee Meetings.
June 21st.—R.C.V.S. **Council** Meetings.
**June 27th.—R.C.V.S. Written Examinations begin.**
**July 3rd.—Provisional date for commencement of R.C.V.S. Oral and Practical Examinations.**

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### Sir Patrick Laidlaw

THE DISTEMPER INVESTIGATION AT MILL HILL.

We are glad to have the opportunity of publishing, from a correspondent in close touch with the special aspect of the late Sir Patrick Laidlaw's scientific work with which it deals, the following further contribution to the record of his activities which we were privileged to insert in our issue of March 30th:—

"The moving tribute to the memory of Sir Patrick Laidlaw which was published in your issue of last week will strike a chord in the hearts of those members of our profession who had been privileged to come into contact with him and had learned not only to admire him as an eminent scientist but also to value his kind and wise guidance.

"One aspect of his work, for reasons of modesty, has not, I venture to suggest, received the measure of consideration in this eulogy which it deserves. To most of us, the close association of Sir Patrick Laidlaw with Mr. G. W. Dunkin in their fruitful investigation into the causes and control of canine distemper, is the outstanding feature of his connection with the profession. The series of joint papers which record the results of the experiments which were undertaken with such meticulous care provide a remarkable testimony to the alliance of a deep scientific knowledge with an appreciation of the practical application of a laboratory investigation.

"Opinions from all parts of the world have amply confirmed the soundness of the Dunkin-Laidlaw methods of immunization. In so far as our profession is concerned, his achievements in this field will be particularly remembered and we shall always recall the debt which we owe to the careful work which was brought to completion at Mill Hill."

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### R.C.V.S. OBITUARY

GILLESPIE, Samuel Duff, Major, A.V.D. (retd.), 5, Windsor Terrace, Malahide, Co. Dublin. Graduated Glasgow, April 15th, 1874. Died February 19th, 1940; aged 91 years.

HOLLINGS, George Parkinson, Bond House, Methley, Nr. Leeds. Graduated London, December 14th, 1893. Died March 16th, 1940; aged 68 years.

MORTON, Sydney Evors, High Wilson Street, Middlesbrough, Yorks. Graduated Edinburgh, July 17th, 1896. Died April 2nd, 1940; aged 65 years.

Mr. Sydney E. Morton, who was well known as a veterinary surgeon on racecourses on the North-East Coast, had been a veterinary surgeon to Middlesbrough Corporation for over 40 years, and had held public appointments with Stockton and Thornaby Corporations and the Ministry of Agriculture.

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Francis Brendan Halpin, of the Royal Veterinary College of Ireland, Dublin, has passed the Second Examination in Veterinary Science (Part 1), for External Students, of the University of London.

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### FOOT-AND-MOUTH DISEASE IN LANCASHIRE

An outbreak of foot-and-mouth disease has been confirmed among cattle and pigs at St. Annes-on-Sea, Lytham St. Annes, Lancashire. The area subject to restriction in the movement of animals lies wholly in the county of Lancashire.

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### LEGAL NOTES

*Swine Fever Order Offences.*—A Huntington, Cheshire, farmer was fined £5 with £2 8s. costs at Chester Police Court last week for failing to give notice of swine fever. He was also fined for failing to bury 21 carcases, £1 for permitting the carcases to remain where dogs had access to them, and £2 for failing to keep unboiled swill from access by animals. Defendant told the magistrates that when about 30 pigs died between December and January he attributed it to the swill he had been giving them and never suspected swine fever.

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At Sidmouth Petty Sessions, recently, Herbert Potbury, Sidmouth, who was represented by Mr. H. Davies, pleaded not guilty to failing to give the required notice of animals in his possession affected with disease.

Superintendent Marshall said defendant was the occupier of Soldiers Hill, Salcombe Regis, where he kept a large number of pigs. On September 25th, owing to a confirmed case of swine fever in the immediate vicinity at Salcombe Hill, an inspector of the Ministry visited defendant's premises, and, as a result, on September 27th it became necessary to put defendant's premises under certain restrictions governing the movement, etc., of the pigs. Defendant was informed that he must give notice of the death of any pig on the premises, unless the cause of death or illness was clearly not that of swine fever. A pig did die on the premises on October 14th and was very properly reported. It was dealt with by the Ministry, and the disease was not declared. The premises were still under some form of restriction on February 7th, when Miss Hutton, an inspector of the Ministry of Agriculture, visited the premises. At that time she found 107 living pigs on the premises. She inspected these and found that eight of the pigs were showing definite signs of swine fever. A man named Beer was present,

and, in consequence of what he told Miss Hutton, she had the carcase of a dead pig exhumed, and it was found to show signs of swine fever. As the result of further inquiries, Miss Hutton discovered that between the end of December and February 6th 18 pigs had died, and that no report had been made to the police of the illness of the pigs. The police, Superintendent Marshall pointed out, would have known nothing of this but for Miss Hutton's visit.

When she explained the position to defendant, he admitted to her that he was fully aware of the death of the pigs, which he attributed to the weather and poor feeding conditions. On February 8th defendant was seen by P.S. Stanning, and when asked why he had failed to report the matter to the police, defendant replied that he did not suspect it was swine fever, and that Beer felt convinced that the pigs died through the bad weather, and shortage of the usual feeding stuffs. He submitted that defendant, or anyone with any knowledge of pigs, ought to have known the signs of swine fever, and that the matter should have been reported to the police.

Miss Barbara Hutton, M.R.C.V.S., veterinary inspector to the Ministry of Agriculture and Fisheries, of Exeter, said she found some of the pigs staggering in their gait, and one or two had discoloration of the skin. Some were coughing. She considered the symptoms had developed in the last fortnight, and it would become more and more obvious as time went on, that they were suffering from swine fever.

Mr. Davies: Were the symptoms those of swine erysipelas?

Witness: No, in that disease there is more reddening of the skin.

P.S. Stanning stated that since his visit on February 27th more pigs had died or had been destroyed.

For the defence, John Beer, employed at the holding by defendant, said there were severe weather conditions in January, and he considered the deaths of the pigs were due to chill, aggravated by change of diet.

Defendant, in evidence, said it would have been in his interests to have reported the matter if he had thought the pigs were suffering from swine fever, as he ran the risk of losing the lot in not doing so.

The Chairman (Sir Archibald Bodkin): If you were doubtful as to the cause of the condition of the pigs, would it not have been better to have called in a veterinary surgeon?

Defendant said he did not feel any doubt about the cause, and was satisfied that the pigs died from exposure to the cold. He had no previous knowledge of swine fever in pigs.

The Chairman said the Bench found that defendant had failed to discharge the obligations placed on him, and fined him £10. He would also have to pay £1 4s. 9d. costs.

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## IMPORTANCE OF RESTORATION OF THE LIVESTOCK SCHEMES

Urging the revival of the official livestock schemes—milk recording and grants for bulls, boars and stallions—the *Farmer and Stock-breeder* says that the decision to discontinue them, taken on the declaration of war, was a hasty one and represented an entirely false "economy" measure. Moreover, there has been a lack of consistency in dealing with livestock and other branches. "For instance, the Minister has contended that ruling prices should, as far as horses are concerned, provide inducement to farmers to continue breeding. Well, if this is so, would not it be reasonable to scrap ploughing grants, the War Executive Committees and so forth, and let prices get what is required? Then it has been denied that breeding would be curtailed if grants were withdrawn. This does not bear the test of history. It was admitted that the withdrawal of grants in 1922, after they had been maintained right through the last war, did in fact prove detrimental to heavy horse breeding. It has also been mentioned that grants would not have any effect upon supplies of heavy horses available during the war. We sincerely hope that this is correct, for it will take at least three years to bring the results of future matings to practical utility.

"But the position must be reconsidered in the light of the policy for agriculture after the war. We fear that the Treasury is an obstacle, but it is for the Minister of Agriculture, the Lord Privy Seal and the Prime Minister himself to take cognisance of the logical implications of their policy. Both numbers and quality of the livestock of the country have a highly important bearing on the future of agriculture. We have full regard for Mr. Chamberlain's warning against the danger of assuming that, because we are already spending so much, a little more does not matter. We trust that he and his colleagues will have equal regard to their aim, 'a reasonably conducted agriculture.' It cannot be reasonably conducted if livestock are neglected. The livestock schemes are a national investment well worth the money. This is the test. If they were worth the expense before they are better worth it now."

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## SCHEME FOR RATIONING OF FEEDING STUFFS

Very careful study is being given by Ministers and officials in Whitehall to the possibility of a rationing scheme for feeding stuffs," states the Political Correspondent of the *Farmer and Stock-breeder*, in the issue of that journal of March 26th, and continues: "It is recognised that a scheme of this character would involve rather complicated machinery on a national scale and affecting every parish and individual consumer, but the official view, I understand, is that some drastic action of this sort will be necessary to end an admittedly difficult and complex problem.

"As all schemes have to be prepared on the assumption of a long war, the view which influences those in authority is that some sort of rationing system will be necessary so that the feeding stuffs will not be a persistent cause of controversy throughout the war years. The point is whether a rationing scheme may bring advantages which outweigh the difficulties. No decision has yet been reached on this proposal, but my information is that the investigation will be pressed on during the next two or three weeks. Parliamentary answers during the past few days show that Ministers fully recognise the importance of the present hatching season to the poultry industry in particular, and special measures are being taken to release greater quantities.

"Once agricultural economy after the first harvest of war-time has been adjusted to allow for increased production of feeding stuffs at home, it is hoped that the problem will become less acute, but there can be no mistake about the care with which Ministers have refrained from buoying up false hopes of greater supplies from abroad."

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## WHEAT FOR STOCK FEEDING

Sir Daniel Hall has questioned the wisdom of releasing an extra quantity of wheat for stock feeding. Pig farmers and poultry keepers welcomed this concession, which has been particularly valuable at the season when pullets are being reared. Looking at the problem from the standpoint of maintaining our breeding stocks, the extra grain made available recently has been most useful. Presumably, the country is not so short of wheat that we cannot afford to take a reasonably long view and ensure that our breeding stocks are maintained. In any case, fewer poultry have been reared this spring. Without the release of this extra wheat the prospects for egg production next winter would be even less satisfactory than they are now.—*The Times.*

## AUGMENTING FEEDING STUFFS SUPPLIES

### Food For Animals From Straw

Lord McGowan discloses in a letter to *The Times* the fact that the research staff of Imperial Chemical Industries has been working on the conversion of straw into a valuable animal food stuff by treating it with caustic soda. This is neither an entirely new process, nor perhaps one which would find a permanent place in the peace-time economy of agriculture, but it is obviously of the first importance in time of war.

"The principle is that the caustic soda, which is applied in a weak solution, breaks down the indigestible cellulose in the straw and thereby releases the digestible elements. It is in fact a predigestion process. The product is not only readily eaten by livestock, but has a substantial food value. A long series of tests has been carried out, and feeding trials have now reached a pitch which indicate that the process is technically accurate. The demonstration plant has been working at Jealott's Hill. The difficulty is how to arrange for practical use to be made of it. There are two alternatives. The first is to design and make available small plants which can be sold to, and used by, the individual farmer for treating his own straw and chaff. These plants are simple and inexpensive, a small one costing perhaps £25 and a larger one £40. The second alternative is to put down factory plants in co-operation with the big firms interested in the production of animal food stuffs, and in sugar beet factories and oil and cake mills, who would treat the straw centrally and mix it with the particular fodder they were distributing. Obviously there are merits and demerits of either alternative, but the general impression is that private enterprise has taken the matter as far as it can. It is now up to the Government to take action if they wish, and to see that the fruits of research are translated into concrete results of benefit to agriculture in time of war."

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### Potato Conversion Factories

On Monday last the Ministry of Food announced additional details of its plans for the setting up of additional factories to convert surplus potatoes into animal feeding stuffs. Arrangements have been made for the operation of six factories. One at Wisbech has been running for four years. A second has been built at Skelmersdale, in Lancashire, and a trial run will probably take place next week. The third and fourth factories will probably be placed near Dundee and Selby, and the fifth in Lincolnshire. The situation of the sixth factory has not been decided upon. It is hoped that the six factories will be ready to operate at the beginning of the potato season next September or October, and that they will deal with 100,000 tons of potatoes during the season. The Farmers' Marketing and Supply Company will be responsible for the staffing and operation of the factories, but the Ministry will purchase the surplus potato crop and will be the owners of the potato meal produced. The establishment of six factories is regarded by the Ministry as only the beginning of the scheme. It may be found possible to utilise certain types of existing factories not fully occupied, particularly those with grass-drying plant, since the seasons for grass and potatoes do not coincide. After the war the new factories will be continued to provide feeding stuffs for farmers.

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## SCOTTISH CLEAN MILK CAMPAIGN

A poster setting out the essential points to be observed as a matter of routine by dairy workers has been issued to each registered dairy farmer in Scotland. Accompanying the poster, which stressed the importance of cleanliness in all the stages of the handling of milk, was a letter from Mr. John Colville, M.P., the Secretary of State for Scotland. In the course of his letter Mr. Colville said: "Milk is the most complete of all foods, and in time of rationing, can be used to make up for many deficiencies in diet. As a consequence, it is important that farmers should co-operate with the local authorities in exercising a close supervision of methods of production. By careful attention to the points set out in the poster Mr. Colville concludes, 'farmers and dairy workers will play an important part in safeguarding the health of the people through a pure milk supply.'"

Points from the poster are:—

Employees suffering from infectious disease should not handle milk and cows with any disease likely to contaminate the milk should be isolated and their milk discarded. Employees affected should inform their employer who must notify the Medical Officer of Health.

The byre should be kept clean and freely ventilated. Floors, walls, troughs, water bowls, etc., must be kept clean. Dry fodder should not be fed just before milking nor should the bedding be disturbed.

Cows should be groomed at least once a day but not immediately before milking. The flanks, tail and udders should, however, be cleaned immediately before and the udders should be washed.

Milkers should see that their hands and their overalls are kept clean. Hands and forearms should be washed before milking each cow. Overalls and caps should be kept specially for the purpose. Wet hand milking must not be practised.

Contamination can be prevented by using domed milking pails and covered carrying pails, keeping all the utensils clean, and discarding any milk which looks abnormal. The first two or three streams of milk from each teat should be discarded. Milk should not be strained in the byre.

All milk utensils should be sterilised after each milking. They should first be rinsed with cold water, washed and scrubbed in hot water and soda, rinsed again, and then sterilised by steam or by boiling. Special attention should be given to milking machines, which should be dismantled at least twice a week, and cleaned and sterilised thoroughly.

When cooling milk, the milk room should be closed and the milk run over the cooler slowly and strained through cotton-wool pads—cloths should be used. Immediately after cooling, the milk should be bottled or run into sterile churns.

All buildings and equipment should be kept clean and free from dust and flies. Animals should not be allowed into the dairy.

* * * * *

## DESTRUCTION OF RABBITS

The Ministry of Agriculture announces that the campaign against "that destructive pest the rabbit" is to be intensified. Under a revised Regulation made by Order in Council in substitution for Regulation 63 of the Defence (General) Regulations, 1939, the Minister of Agriculture and Fisheries has made an Order—The Rabbits Order 1940—which revokes the Rabbits Order 1939 and delegates further powers in respect of rabbits to the County War Agricultural Executive Committees.

The Committees now have power themselves to make an Order requiring any person having the right to kill or take rabbits on his land to carry out the necessary steps for that purpose within a definite time, to be specified in the Order. Failure to comply with such Order is a punishable offence, and, without prejudice to any legal proceedings for non-compliance, the Committees may enter on the land for the purpose of killing and taking the rabbits.

* * * * *

## PHARMACY AND POISONS ACT, 1933

The Home Office, in a recent announcement, draws attention to the Poisons List (Amendment) Order, 1940 (S.R. & O. 1940, No. 453) and the Poisons (Amendment) Rules, 1940 (S.R. & O. 1940, No. 452) which were made by the Secretary of State on March 29th, 1940, and came into operation on Monday last.

The Order and Rules amend the definition of sulphanilamide derivatives contained in the item "Para-aminobenzene sulphonamide" which was added to Part I of the Poisons List by the Poisons List (Amendment) Order, 1938, and the First and Fourth Schedules to the Poisons Rules, 1935, by Rules 5 and 7 respectively of the Poisons (Amendment) Rules, 1938; the amendment consists in

the replacement of the words "derivatives of para-aminobenzene sulphonamide having one or both of the hydrogen atoms of the para-amino group substituted by other radicals" by the words "derivatives of para-aminobenzene sulphonamide having any of the hydrogen atoms of the para-amino group or of the sulphonamide group substituted by another radical."

Sulphonal and alkyl sulphonals are now included in the First Schedule.

Copies of the Order and of the Rules may be purchased (price 1d. net each) directly from H.M. Stationery Office at the following addresses:—York House, Kingsway, W.C.2; 120, George Street, Edinburgh, 2; 26, York Street, Manchester, 1; 1, St. Andrew's Crescent, Cardiff; 80, Chichester Street, Belfast; or through any bookseller.

* * * * *

## THE DRUG TRADE IN INDIA

A Bill, which extends to the whole of British India, and which has been introduced in the Legislative Assembly, seeks to control "all medicines for internal or external use of human beings or animals, and all substances intended to be used for or in the treatment, mitigation, or prevention of disease in human beings or animals."

"So far as the general run of drugs is concerned," writes a correspondent in a recent issue of *The Times*, "the standards with which compliance will be expected are those of the British Pharmacopoeia or the British Pharmaceutical Codex, ' or any other prescribed pharmacopoeia, or adopted by the Permanent Commission on Biological Standardisation of the League of Nations.' In the case of vaccines, sera, anti-toxins, and biological products of such nature, and vitamins, hormones, and analogous products, the standards proposed are those maintained at the Medical Research Institute, Hampstead. The Bill provides that all such substances, whether imported or whether produced in any of the Provinces, shall not only be in accordance with those standards, but shall also comply with other requirements designed to prevent misbranding. Thus it seeks to make it unlawful to misdescribe the country of origin of a drug or to 'colour, coat, powder or polish' it so as to conceal damage or to make it appear of 'greater therapeutic value than it really is.' It is sought, also, to prohibit 'exaggerated' claims whether on labels or accompanying literature.

"Some of the provisions of the Bill on the importation of drugs go beyond British practice. Thus they empower the authorities to 'prescribe the places at which drugs may be imported and prohibit their import at any other place"; they also give Customs officers power to detain goods suspected of being below standard or misdescribed, and to confiscate them. This provision is not the only evidence that the framers of the Bill have studied the relevant legislation of the United States at least as closely as the English counterpart. This is seen more clearly in the clauses which apply to proprietary medicines, for this group is brought within the scope of the Indian Bill.

### Proprietary Medicines

"As the primary object of this proposed legislation is to enforce compliance with standards, and so wipe out the bad name which India's drug supply has acquired, it may be doubted whether it is wise to introduce into it a category of medicines for which there can be no uniform standards as a group. That control of the proprietary medicine trade of India is desirable is not denied, but would it not be expedient to deal with this more controversial and complicated problem in a separate Bill? Be that as it may, the absence of standards for proprietary medicines has been made good by the ingenious method of making the label the standard and so placing its choice on the manufacturer. The actual standard laid down in the Schedule is:—

> The formula or list of ingredients displayed in the prescribed manner on the label or container, or the formula disclosed to the Central Drugs Laboratory, as the case may be.

"It is made clear in an explanatory clause that it is not the intention to require 'a full and detailed recipe of the ingredients,' and that it will suffice if the label 'indicates correctly all potent or poisonous substances contained therein together with an approximate statement of the composition of the medicine.' An important export trade to India is done in British proprietary medicines, composed in the main of articles which are household words in this country, and while there is reason to believe that it is not in the minds of the sponsors of the Bill to do more than discriminate between genuine articles of this class and worthless ones, British proprietary medicine interests will be well advised to scrutinise the text of this Bill."

* * * * *

## THE FINNS AND THEIR ANIMALS

A letter published in *The Times*, over the signatures of many prominent persons, prior to the conclusion of hostilities in Finland, commended the efforts of the R.S.P.C.A. to raise funds to help the Finnish Army Veterinary Corps to relieve the war sufferings of animals in Finland. On the following day, that paper published a despatch from its Special Correspondent in Northern Finland, in the course of which he observed: "Animals as well as men are taking part in the Finnish war. Not that it is a cavalryman's campaign; horses are not of much use among these frozen lakes and snowdrifts. . . . But if in this war, as the French would put it, the horse is something of an ***embusqué***, the same cannot be said of the cow. She may be found right in the front line, and even on the field of battle. Hers is the gallant role of ***vivandière***, for she supplies that milk which, mixed with oatmeal, the Finnish soldier regards as the best drink in the world. The reindeer, among Finnish combatants, is of course the scout. On certain sectors of the Arctic front he pulls with extraordinary swiftness not only the ***pulkas*** of those Lapps who make such excellent guides, but the sledges of the Finnish patrols and raiding parties. There are seldom more than five or six raiders in a party, and they must go on skis unburdened of every possible weight. It is the reindeer who bounds with them into the remote corners of the Arctic forests, pulling the explosives and machine-guns with which the raid will be brought to a successful conclusion. But, in spite of his candid and peaceful gaze, the reindeer is not an easy beast to manage. To drive a ***pulka*** it is not enough to have brawny arms; one must understand the nature of the animal, his obstinacy, his pride, his caprice, which sympathetic handling can subdue. The first time I attempted it there was a full half-hour of desperate cries, cracks of the whip and horrible insults before my reindeer decided to set off. Once started, there was no means of stopping him, but luckily I fell off into the snow after five minutes of mad progress, or he might have taken me to Murmansk.

"For safety the Finns have driven more than 10,000 reindeer, representing an enormous quantity of meat, towards the Swedish frontier, but it is unlikely that they will be able to save the few hundred foxes scattered among their forests. These animals were dying out for some years, until others were brought from Russia and Canada to keep the stock alive. The common fox mated with the silver and polar varieties, with results interesting to the furrier, and much was hoped of the trappers' trade. But it is doubtful if these creatures will survive the rigours of war; probably their place will be taken by those wolves from the forests of Kola which, with grim appropriateness, follow processionally behind the Soviet transports.

"The bears are also disappearing. In spite of the law which protects them, their number has been decreasing for many a long year; and the Russians will do the rest. Already the Red soldiers are tracking them down, knowing that their flesh, though not particularly succulent, is more appetising than the food provided by the masters of the Kremlin.

"One creature alone profits by these sad circumstances. He is the capercailzie. In time of peace 14,000 capercailzie are killed every year in northern Finland, to be exported for the tables of Sweden and Norway. This slaughter must cease; but all the other animals will suffer by the war—including the Muscovite Bear."

* * * * *

## BEHAVIOUR OF TSETSE FLIES

"Under the title of 'Studies in the Physiology and Behaviour of *Glossina morsitans*,' R. W. Jack, chief entomologist for Southern Rhodesia, gives a detailed account of observations made upon this species of tsetse fly (Mem. Depart, Agric., Southern Rhodesia, No. 1, 1-203; 1939). It embodies, in the main, the results of laboratory research, but certain field data are also included. It is evident, according to the author, that *Glossina morsitans* can thrive under a relatively wide range of conditions, given an adequate food supply. The only extremes of climatic conditions which might exclude *G. morsitans* from extensive tracts of country appear to be too low a mean temperature, which retards reproduction below the survival limit, and too high a maximum temperature especially if it is associated with an inferior cover of vegetation. Interference with the food supply is undoubtedly the best general method of eradicating this insect. It is possible, and economically feasible, in Southern Rhodesia to clear any kind of country of *G. morsitans*, but only at present at the expense of the wild game. With the object of finding alternative measures which can be used over wide areas, it is necessary to continue both laboratory and field research. Not enough is known to combat the fly in its habitat and at the same time to spare the game. A large proportion of the country in Southern Rhodesia infested with *G. morsitans* is relatively sterile, largely waterless, mostly unfit for Europeans and only capable of supporting a very scattered native population. Such areas constitute the major problem because, unless they can be cleared of the tsetse fly or shut off by an effective barrier, they will remain a constant danger to more valuable land where it may otherwise be possible to control the situation."—*Nature*, Oct. 21st, 1939.

* * * * *

## GERMAN SUBSTITUTES FOR PHARMACEUTICALS

News which filters through neutral countries shows that strenuous efforts are being made in Germany to produce at home commodities which in normal times are imported from abroad. Drugs and chemicals are no exception. The Berlin correspondent of the *Journal of the American Medical Association* stated recently that progress had been made in producing albumin—formerly imported in large quantities—from the serum of cattle; a new raw material called postonal had been created by polymerisation for use as a substitute for cocoa butter; hardened walnut oil and oils obtained from the seeds of fir and pine cones have proved to be successful substitutes for lard in ointment bases; and buna, artificial rubber, is widely used for surgical gloves and other purposes. Apparently in the districts round Berlin the patients in hospitals and sanatoria are to undertake the cultivation of medicinal herbs as a sort of "work therapeutics," and in other parts of Germany plans are being made for children to gather medicinal and culinary herbs. The German council of economic management has recently warned members of the public against the indiscriminate use of drugs without medical advice and the excessive use of anodynes and hypnotics is regarded as harmful to the national life. Advertisers of baby foods are not allowed to create the impression that such foods are as good as breast milk or even provide a good substitute for it.—*Pharm. J.*

* * * * *

To meet cases of hardship, where valuable breeding stock is in danger of being slaughtered through lack of feeding stuffs, the Ministry of Food has set up a reserve of feeding stuffs in each county. The reserve is fixed on the basis of 100 tons for an average administrative county, and is restored to full level when it falls to 50 per cent. In most counties the reserve is already being drawn upon.

* * * * *

Under the Government Livestock Scheme there is a considerable addition to the usual number of animals sent to Dorchester slaughterhouses, and it is impossible for the meat inspector to inspect the whole of the carcases. An endeavour is being made to arrange for assistance.—*Dorset County Chronicle.*

* * * * *

Dr. S. J. Cowell, Professor of Dietetics in the University of London, will open a discussion on "Food in Wartime" at a Sessional Meeting to be held at the Royal Sanitary Institute, 90, Buckingham Palace Road, London, S.W.1, on Tuesday, April 16th, at 5 p.m. The chair will be taken by Sir Wilson Jameson, M.A., M.D., F.R.C.P.

# CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

*The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.*

* * * * *

## SIR JOHN M'FADYEAN AND THE COUNCIL OF THE ROYAL COLLEGE OF VETERINARY SURGEONS

To the Editor of the Veterinary Record

Sir,—Like many others, I support most warmly the letter of Professor McCunn in your issue of March 16th, regarding the withdrawal of Sir John M'Fadyean from the Council, and suggest that some means should be adopted whereby his invaluable services with his vast experience as Member of the Council, might be retained without subjecting him and such type of men to the turmoil and sometimes the risk, under a snatch vote, of an election. The case of Dr. Whitehouse last year was a case in point, though the "accident" to him was remedied.

The withdrawal of Sir John M'Fadyean this year is a loss which we can ill afford. Fresh blood is often advisable, but without an admixture of experienced men, it can easily be a calamity in a profession such as ours.

Public Councils, such as those of counties and boroughs, recognise, and retain, the services of experienced men without subjecting them to ordinary election, by making them Aldermen.

*Our lesson*: The older members must be retained as members when possible.

Yours faithfully,
Edward Morgan.

"De Lejos,"
Crest Road,
Hayes, Kent.
*March 30th*, 1940.

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